9:30

5aAOa7. Comparing high-frequency scattering by a fish swimbladder and a gas-filled ellipsoid. Kenneth G. Foote (Woods Hole Oceanogr. Inst., Woods Hole, MA 02543) and David T. I. Francis (Univ. of Birmingham, Birmingham B15 2TT, UK)

High-frequency backscattering spectra have been computed for two air-filled sacs at 51-atm ambient pressure by means of the boundary-element method. One applies to the swimbladder of a 39-cm-long specimen of pollack (*Pollachius pollachius*), with known morphometry expressed in a 3181-node mesh. The other applies to a prolate ellipsoid, whose major axis is that of the mapped swimbladder, 14.1 cm, and whose minor axis, 1.24 cm, has been determined so that the volume of the ellipsoid is essentially identical to that of the mapped swimbladder. The dorsal-aspect backscattering cross section of each sac has been computed at each frequency over a normal distribution of tilt angles, measured relative to the longitudinal or major axis, with mean −4.4 deg and standard deviation 16 deg. Computations have been performed over the frequency range 20–40 kHz in increments of 25 Hz. The spectra are characterized and compared. [Work supported by ONR.]

9:45

5aAOa8. Some anomalous time domain back scattering phenomena from low contrast fluid spheres and cylinders. C. Feuillade (Naval Res. Lab., Stennis Space Ctr., MS 39529-5004), D. Chu (Woods Hole Oceanogr. Inst., Woods Hole, MA 02543), and C. S. Clay (Geophys. and Polar Res. Ctr., Univ. of Wisconsin—Madison, Madison, WI 53706)

Anderson's scattering theory [J. Acoust. Soc. Am. **22**, 426–431 (1950)], and the corresponding formalism for an infinite cylinder, have been used to calculate the scattered impulse responses for low contrast fluid spheres and cylinders, where the density and sound speed of the object are fractionally higher than the surrounding medium. The returns from the front and rear faces of the object are individually identifiable. In the case of a sphere, both of these features are positive spikes. In the cylindrical case, the second feature is a negative first derivative of a spike. In both instances, the waveform of the second feature is different from that expected from simple physical reasoning, i.e., the raypaths and reflection coefficients. The predictions of the calculations are investigated by using them to analyze experimental scattering data from decapod shrimp near broadside incidence. By convolving the calculated impulse response with the incident acoustic signal, comparisons with the scattering data are made. Both the sphere and cylindrical calculations appear to fit the data well. The significance of these results, and possible explanations for the anomalous scattering from the rear face, are discussed. [Work supported by ONR, University of Wisconsin Weeks Fund.]

10:00

5aAOa9. Modeling of surficial sediment alteration by biology. Dajun Tang (Appl. Phys. Lab., Univ. of Washington, Seattle, WA 98105)

This paper describes fine-scale measurements and modeling of surficial sediment roughness at a site in the East China Sea using a conductivity probe. The spatial resolution of the measurements is designed to obtain environmental data suitable for modeling acoustic backscatter in the mid-frequency (3–4 kHz) range. The power spectrum of the bottom roughness is estimated and it is found that bottom roughness is dominated by small features caused by bottom-dwelling organisms. This is confirmed by video images of the same spot of seafloor. A model is developed to simulate the random distributions of these bottom features. The model employs a superposition of discrete features, which result in a power spectrum that is consistent with the measured power spectrum. Potentially this kind of model can provide a remote sensing means to estimate bottom biological populations through measuring sound backscatter from the bottom. [Work supported by ONR Ocean Acoustics Code.]

10:15

5aAOa10. The Bergen multifrequency analyzer (BMA): A new toolbox for acoustic categorization and species identification. Egil Ona, Rolf Korneliussen, Hans Petter Knudsen (Inst. of Marine Res., P.O. Box 1870, 5817 Bergen, Norway, egil.ona@imr.no), Kjell Rang, Inge Eliassen, Yngve Heggelund, and Daniel Patel (Christian Michelsen Res. AS, 5892 Bergen, Norway)

Multifrequency split-beam echo sounders with nearly identical and overlapping acoustic beams have been regularly used in acoustic surveys for fish stock abundance estimation. Calibrated raw data from up to six simultaneously working echo sounders at 18, 38, 70, 120, 200, and 364 kHz were applied for developing a new processing tool for real-time acoustic target categorization and acoustic species identification. The system now handles raw data from the Simrad EK500 and EK60 split-beam echo sounders, and performs a stepwise, modular sequence of analysis, like bottom detection, noise quantification and removal, target categorization, and school detection in near-real time. Direct generation of new, synthetic echograms, based upon the measured frequency response of the targets, is also one of the most useful features of the system. This information may significantly increase the accuracy of acoustic survey estimates of fish and zooplankton. New routines for noise removal, target categorization, and school detection will be presented, as well as new methods for training and building the artificial experience of the analyzer.

10:30

5aAOa11. An echo analysis technique for estimating the fish population. C. P. Anil Kumar, Sajith N. Pai, N. Soniraj, M. H. Supriya, James Kurian, C. Madhavan, and P. R. Saseendran Pillai (Dept. of Electron., Cochin Univ. of Sci. and Technolgy, Cochin-22, Kerala, India)

The development of an algorithm for the estimation of biomass by acoustic remote sensing is presented in this paper. The distinctive features of the algorithm include the implementation of time-varied gain function, proper accounting of beam factor effects, implementation of backscattering levels for selected species and processing for echo-count as well as echo-integration. In order to optimize the backscattering levels, numerical analysis for geometrical backscattering of selected marine species were carried out and validated with *in situ* measurements. The biomass information of the concerned marine specie is made available by subjecting the backscattered raw data to a series of processes. The performance validation of the algorithm under *in situ* conditions yielded encouraging population estimation results and is being fine-tuned with the field data. This algorithm will provide an efficient technique to parametrically compute the target strength, leading to the estimation of the stock of commercially important selected marine species under varied environmental conditions in different regions.